RESEARCH ARTICLE

Arthroscopic Recession Technique in the Surgery of Tennis Elbow by Sharp Cutting the Extensor Carpi Radialis Brevis (ECRB) Tendon Origin

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Received: 27 March 2020 *Accepted: 13 June 2020*

Abstract

Background: The aim of this study was to assess the functional outcomes and time to improve after the modified arthroscopic technique (recession technique) by using a knife to sharply cut the extensor carpi radialis brevis (ECRB) tendon origin in patients with recalcitrant tennis elbow.

Methods: In a prospective study, we included 11 consecutive patients. Following the routine elbow arthroscopy and after exposing the ECRB tendon, we used a knife (no. 11 blade) to cut the tendon at the level of radiocapitellar articulation while avoiding the lateral collateral ligament, which is considered a tendon recession as is done in spastic muscles. Patients were followed up for 1, 3, 6, and 12 month intervals and were asked to fill the Mayo Elbow Performance Index (MEPI), Quick Disabilities of the Arm Shoulder Hand (QuickDASH), and Patient-Rated Tennis Elbow Evaluation (PRTEE).

Results: The mean PRTEE, QuickDASH, and MEPI scores showed significant improvement over time (*P<0.001*). There were 5 excellent, 5 good and 1 fair results based on MEPI. The patient with fair result was the only patient with existing varus instability on examination under anesthesia although we could not elicit the test positive on clinical examination. Substantial functional and pain improvement was reported almost 6 months after surgery. We did not find any nerve injury or post-operative infection.

Conclusion: Arthroscopic recession surgery by using a knife is a safe and effective way in managing recalcitrant tennis elbow although patients should be informed of the expected time to improve. A simple tendon recession by a sharp cut is a time-saving technique that works effectively and is comparable with the piecemeal shaving.

Clinical Relevance: The modified muscle recession technique is a rapid and safe way to manage the recalcitrant tennis elbow arthroscopically while the outcomes are comparable to the routine piecemeal shaving of the pathologic tissue.

Level of evidence: IV

Keywords: Arthroscopy, ECRB, Recession, Tennis elbow

Introduction

Enthesopathy of the extensor carpi radialis brevis (eECRB) often referred to as tennis elbow is a benign and self-limiting condition with no cumulative feature with aging as is seen with knee osteoarthritis. However, 4-10% of patients with eECRB who are not satisfied with nonoperative modalities may be offered

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surgery (1, 2). Moreover, it is shown that the rate of surgery is higher in patients receiving corticosteroid injection (CSI) (3). This can be attributed to more severe condition or even medicalization with no benefit of CSI over placebo (4).

Tennis elbow is a degenerative condition caused by the friction of the elbow extensor tendons, especially ECRB tendon against the lateral aspect of capitulum (5). Following repeated tensions, friction and microtears in the tendons, a degenerative process occurs resulting in tendinosis (5). This chain can be broken by partially releasing the ECRB origin.

Arthroscopic intervention is possibly superior to open surgery due to a better visualization of intra-articular structures, less-appealing incisions, easy to convert to open surgery, and a clean intact elbow for practicing elbow arthroscopy (2, 6) . However, there are concerns and difficulties with elbow arthroscopy including patient positioning, nerve injury, and the smooth slope of the learning curve for elbow arthroscopy (7-9) . In most techniques, the pathologic tissue is debrided and removed using a shaver or radiofrequency ablation from the distal level of the degenerated tendon proximally up to the lateral epicondyle, which takes a longer time to remove the pathologic tissue (10). In our technique, we used a no.11 blade to cut the ECRB tendon perpendicular to its fibers at the level of the radiocapitellar joint which takes shorter operating time relative to piecemeal debriding the tissue. This was meant to act as a tendon recession to partially release the ECRB origin, unload the lateral epicondyle, and allow the tendon to heal in a longer length. The aim of this study was to assess the functional outcomes and time to improve after arthroscopic recession of the ECRB tendon in patients with recalcitrant tennis elbow.

Materials and Methods

This prospective observational study was conducted on 11 consecutive patients who underwent arthroscopic surgery for recalcitrant tennis elbow from 2017 to 2019 in a level 1 university hospital. The study protocol was approved by the Ethical Committee of the University (Code: 970277). All patients signed a written informed consent prior to participating in the study.

Patients

Tennis elbow was diagnosed by an orthopedic elbow surgeon and surgeries were all done by a single surgeon (ARK). Diagnosis was based on lateral elbow pain, tenderness over the lateral epicondyle, and elicited pain with resisted wrist extension and elbow in extension. Magnetic resonance imaging (MRI), anteroposterior and lateral elbow radiographs, and electrodiagnostic study (EDx) were done for all patients prior to surgery to rule out concurrent radial nerve involvement or other elbow pathologies in the MRI per institutional protocol. Patients were offered surgery if symptom duration was more than 6 months and the intensity of pain was greater than 5 on a scale of 0-10, and if nonoperative treatments including physiotherapy and corticosteroid injection were failed to improve or recurred with greater pain intensity. Of note, the initial nonoperative treatment including CSI was provided by the primary physicians for most of the patients in our cohort and the patients were referred for surgery due to failed nonoperative management. Exclusion criteria were elbow fractures, history of rheumatoid arthritis or hemophilia, neurological disease, radial tunnel involvement on EDx, and limited range of elbow motion. Patients were asked to complete the questionnaires and were followed at 1, 3, 6, and 12 months after surgery.

Arthroscopic procedure

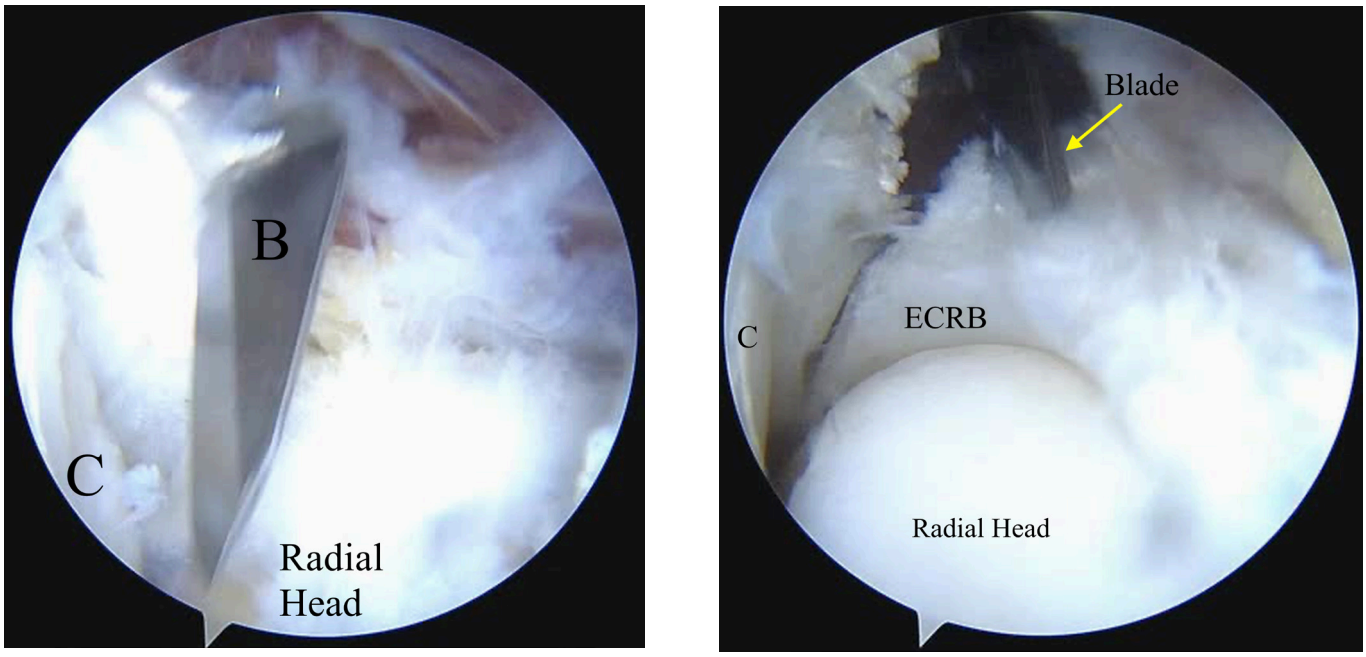
Under general anesthesia, elbow was first examined for instability and range of motion. Patients were positioned in a lateral decubitus with the arm resting over the arm holder with the tourniquet on. Standard outside-in proximal anteromedial portal was created 1 cm above and 2 cm anterior to the medial epicondyle through which the anterolateral portal was made using the needle technique. Anterolateral portal was created just above the radial head at the radiocapitellar joint. Proper position was confirmed under arthroscopic visualization through the anteromedial portal by entering a needle. Anterior elbow was explored for any other pathologies. Shaving of the synovium was started from inside to reach to the common extensor origin. The technical description so far is the same as the conventional technique. After exposing the tendinous portion of the extensor carpi radialis brevis (ECRB), instead of piecemeal shaving of the pathologic tissue, the tendinous part of the ECRB was cut sharply by carefully entering a knife (no-11 blade) to the joint through the anterolateral portal. Cutting was started from above the radial head and below the muscle fibers of extensor carpi radialis longus (ECRL) down to the equator of radiocapitellar joint to avoid further injury to the lateral collateral ligament [Figure 1 a; b]. In contrast to piecemeal shaving of the diseased tendon, a sharp cut was made across the tendon as a recession of the ECRB as it is done in spastic muscles which saves time in compare to piecemeal shaving. Surgery was concluded shortly after muscle recession.

Postoperative protocol

Elbow was splinted for 2 weeks in 90 degrees of flexion with the forearm and wrist in neutral position to avoid wrist flexion. Elbow motion and physical therapy was started at 2 weeks with the splint on at rest and at nights for 2 more weeks. After 4 weeks, patients were instructed to keep the splint on only at nights for another month. Isotonic active and active assisted exercises were encouraged during this period to regain motion. Moreover, overhead exercises were encouraged to avoid varus stress. No patient received any injection during post-operative follow-up.

Measurement tools

Demographic characteristics including age, gender, history of corticosteroid injection, job, dexterity, and



(a) (b)

Figure 1. Using anteromedial portal to view the lateral side of the joint. Synovium is removed and the extensor carpi radialis brevis (ECRB) is exposed. (a) Under control, a no.11 blade is entered to the joint via the anterolateral portal with the edge facing posteriorly. (b) The blade is moved within the radiocapitellar interval down to the equator of the radiocapitellar articulation to avoid injury to the lateral collateral ligament. Using this technique, the ECRB tendon is sharply cut.

symptom duration were collected. To compare pre and post-operative results, we used Mayo Elbow Performance Index (MEPI), Quick Disabilities of Arm Shoulder Hand (QuickDASH), and Patient-Rated Tennis Elbow Evaluation (PRTEE).

MEPI assesses pain, stability, arc of motion, and daily function with the total score ranging between 0-100. MEPI score is categorized into 4 groups of <60 as poor, 60-74 as fair, 75-89 as good, and 90-100 as excellent (11).

QuickDASH assesses upper extremity disability in performing certain tasks during the last week. It scores between 0 to 100 with larger numbers showing greater disability (12).

PRTEE was created in 2007 which is meant to measure pain and disability particularly in patients with enthesopathy of the extensor carpi radialis brevis (tennis elbow). It is a 15-item measure divided into 2 subscales of Pain and Function scoring 0-100 with 0 showing no pain and no disability while 100 shows worst imaginable pain and unable to do (13).

Statistical analysis

The normality of the continuous variables was assessed using the Shapiro-Wilk test. Continuous variables were presented using mean and standard deviation (SD) and categorical variables were presented using frequency and percentage. Outcome changes over time was assessed using Repeated Measure Analysis of Variance (ANOVA). Comparison of the outcomes between pre-operation assessment and follow-up time point assessments was performed using paired t-test. Linear regression analysis was done to assess the effect of variables on the functional scores. The level of statistical significance was considered as $P<0.05$.

Results

A total of 11 patients participated in this study. Tennis elbow was present in the right elbow in all but one participant while all patients were right-handed [Table 1]. Examination under anesthesia was positive for varus stress test in 1 patient although examination in the clinic did not reveal laxity.

According to the MEPI score, 5 patients were Excellent, 5 patients were Good, and 1 was Fair. The patient with fair result was the patient with varus laxity on examination under anesthesia. There was a significant difference in PRTEE between pre-operation and 1st month ($P=0.033$), 3rd month ($P=0.003$), 6th month ($P<0.001$), and 12th month ($P<0.001$) as well as between 3rd month and 12th month assessments ($P=0.019$) [Table 2; Figure 2]. The quick-DASH score was significantly different between pre-operation and 3rd month ($P<0.001$), 6th month ($P<0.001$) and 12th month ($P=0.001$) and between 1st month and 12th month assessment ($P=0.015$) [Table 2; Figure 3]. The MEPI

score was significantly different between pre-operation and 3rd month (*P=0.004*), 6th month (*P<0.001*), and 12th month (*P<0.001*) and between 1st and 3rd month (*P=0.021*) [Table 2].

By using linear regression analysis, we did not find any significant effect of CSI, symptom duration, sex, dexterity, and age on the final QuickDASH (*P=0.73*), PRTEE (*P=0.47*), and MEPI (*P=0.59*) scores, which is probably affected by the small number of patients. The number of CSI is presented in Table 1.

Complications

Only one patient with obvious varus laxity on examination under anesthesia showed fair result at the final follow-up due to persistent night pain while she was able to perform activities of daily living. The patient had the history of two CSI with skin depigmentation and atrophy at the time of surgery. She was the only patient who had surgery on the left elbow while the other 10 patients had surgery on the right side. We did not observe any infection or nerve injury. One patient complained of persistent swelling and varus appearance of the elbow at 6th month which was resolved at 12 months. Mild pain with activities were reported in 5 patients with Good MEPI result at the final follow-up. No patient ever complained of feeling instability.

Table 1. Demographic data

Age, mean (SD)	42 (6.8)
Symptom duration (month), median (25-75 IQR)	18 (10-24)
Sex, no. (%)	
Male	3 (27)
Female	8 (73)
Side, no. (%)	
Right	10 (91)
Left	1 (9)
Dexterity, no. (%)	
Right-handed	11 (100)
Left-handed	0
History of CSI, no. (%)	
No	2
2 times	7
3 times	1
5 times	1

SD: Standard deviation; CSI: Corticosteroid injection; IQR: Interquartile range

Table 2. Progressive improvement after arthroscopic tennis elbow recession

		Pre-operation	1 month	3 months	6 months	12 months
Pain (0-50)	Mean ± SD	35±6.5	20±13	24±10	14±9	11±10
PRTEE (0-100)	Mean ± SD	67±14	41±26	37±15	29±17	22±19
Quick-DASH (0-100)	Mean ± SD	56±15	39±28	26±14	20±16	15±16
MEPI (0-100)	Mean ± SD	56±9	67±20	79±14	89±10	90±10

PRTEE: Patient-Rated Tennis Elbow Evaluation; MEPI: Mayo Elbow Performance Index; QuickDASH: Quick disabilities of the arm shoulder hand

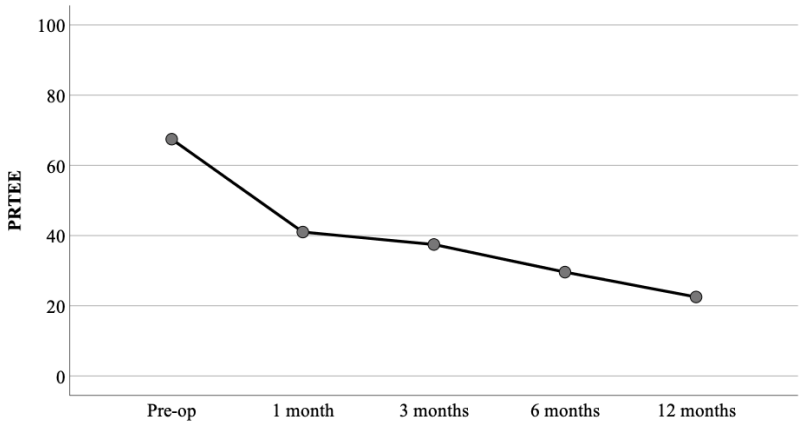


Figure 2. The graph illustrates improvement over time that was assessed by patient-rated tennis elbow evaluation (PRTEE).

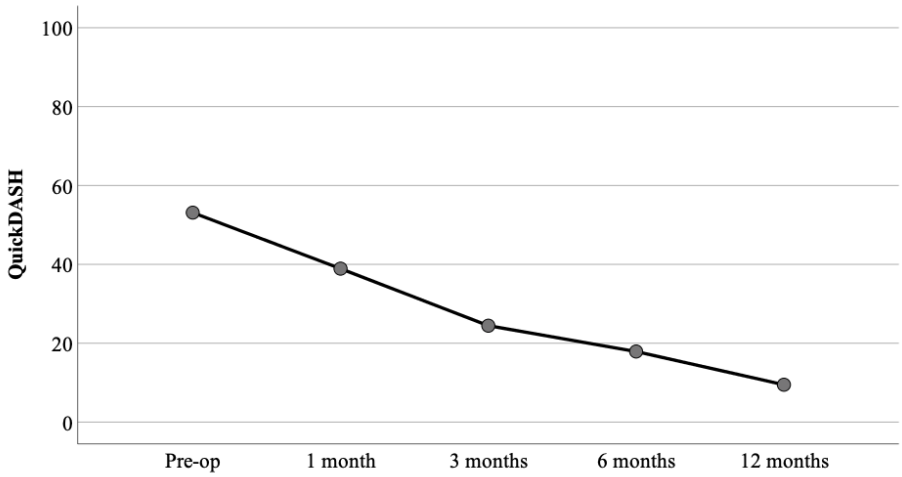


Figure 3. The graph illustrates improvement over time that was assessed by quick disabilities of the arm shoulder hand (QuickDASH).

Discussion

We aimed to assess the functional outcomes of arthroscopic ECRB recession using a knife for recalcitrant tennis elbow. Our findings showed that the tendon recession by using a knife was a safe and reproducible technique which saves time at surgery and allows healing with little or no residual instability. Also, our findings suggest that progressive improvement should be expected after arthroscopic surgery which might take about 6 months. Injection of tennis elbow does not always work, and surgery is sometimes necessary. Aggravation or recurrence after platelet rich plasma (PRP) or corticosteroid injection has been reported (14).

One of the limitations of our study was the small number of patients, which did not allow to compare with a control group. The time to follow-up was almost 12 months; however, we need longer follow-ups to be able to comment on the long-term results. The study results might be influenced by the learning curve in the introduced recession technique by using a knife.

Suffering from the condition for a long time and prior nonoperative treatments including multiple corticosteroid injections may affect the lateral elbow compartment hindering complete improvement after surgery. It seems that in a long term, the persistent tendinopathy might progress to involve the adjacent periosteum and subsequently the bone causing osteitis and bone edema (15). Thus, any conservative management including injection would not presumably be successful until the area is unloaded by cutting or removing the diseased tissue. Our data supports that the arthroscopic surgery is beneficial in these patients by unloading the tendon insertion and the epicondyle. We are not sure if prior CSI might an influence on the healing after surgery, however, we were not able to show any significant effect between prior CSI and the outcomes after arthroscopic surgery.

In our patients, we unloaded the ECRB origin and the adjacent bone by sharply cutting the tendinous part allowing it to heal over time. All of our patients showed improvement to varying degrees. We did not observe any recurrence or aggravation of pain in our patients in the short-term, and the technique did not cause any nerve injury. One advantage of this technique is eliminating the use of a shaver which may inadvertently injure the cartilage when working in a small area. The ECRB tendon is located above the radiocapitellar equator where a shaver may not reach this lateral corner enough to remove the whole diseased tissue. This is intuitive that cautiously performing the knife technique is a safe way to save time at tennis elbow surgery although it might be suggested to use a cannula to protect the knife from inadvertently injuring the nerve.

In a prospective study on 30 arthroscopic tennis elbow surgery in 2019, the overall pain reduced from 5.3 to 1.5 over a 6-month period based on visual analog scale (VAS) (16). Moreover, QuickDASH and MEPI scores showed the same trend of improvement for 6 months after surgery. In another study on 44 patients undergoing arthroscopic tennis elbow surgery, reduction in VAS for pain occurred over a mean 16.8 months follow up (16). This finding was in line with the findings of our study showing that improvement may take up to 6-12 months. In another study on 14 arthroscopic treated patients, changes in pain scores over a two-year period revealed a significant reduction in pain scores over time (17).

Arthroscopic recession surgery by using a knife is a safe and effective way in managing recalcitrant tennis elbow condition although patients should be informed of the expected time to improve which might take about 6 months. Moreover, patients must be examined for concurrent elbow laxity which might have an

influence on the results. Tendon recession by using a knife is a fast technique that seems to work effectively, and the healing process seems comparable in results and healing time with the routine piecemeal shaving technique.

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